



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/520,966

09/16/2005

Vadim I. Rakhovsky

VAD-100US

4940

23122 7590 12/30/2008
RATNERPRESTIA
P.O. BOX 980
VALLEY FORGE, PA 19482

EXAMINER

NEWPORT, JONATHAN M

ART UNIT

PAPER NUMBER

4176

MAIL DATE

DELIVERY MODE

12/30/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/520,966	Applicant(s) RAKHOVSKY, VADIM I.	
	Examiner JONATHAN M. NEWPORT	Art Unit 4176	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>04/01/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the applicant's communication filed on 01/10/2005. In virtue of this communication, claims 1-14 are currently presented in the instant application.

Foreign Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Russia on 07/11/2002. It is noted, however, that applicant has not filed a certified copy of the Russian application as required by 35 U.S.C. 119(b).

Title

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: A MAGNETOSTRICTIVE ACTUATOR BASED TWO-DIMENSIONAL NANOPositioning STAGE.

Drawing Objections

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "2 3" has been used to designate both crude positioning stage and fine positioning stage. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the

Art Unit: 2886

applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

In addition to Replacement Sheets containing the corrected drawing figure(s), applicant is required to submit a marked-up copy of each Replacement Sheet including annotations indicating the changes made to the previous version. The marked-up copy must be clearly labeled as "Annotated Sheets" and must be presented in the amendment or remarks section that explains the change(s) to the drawings. See 37 CFR 1.121(d)(1). Failure to timely submit the proposed drawing and marked-up copy will result in the abandonment of the application.

Specification Objections

5. The abstract of the disclosure is objected to because in line 9 of the abstract, "cinematically" should be changed to --kinematically--. Correction is required. See MPEP § 608.01(b).

Claim Objections/Minor Informalities

6. Claims 1-7 are objected to because of the following informalities:

Claim 1, line 2, "with attached" should be changed to --attached to a --;

claim 1, line 3, "it" should be changed to --the foundation element--;

claim 1, line 4, "crude stage" should be changed to --crude positioning stage--;

claim 1, line 5, "crude stage" should be changed to --crude positioning stage--;

claim 1, line 7, "crude stage" should be changed to --crude positioning stage--;

claim 1, lines 7, "fine stage" should be changed to --fine positioning stage--;

claim 1, line 10, "crude stage" should be changed to --crude positioning stage--;

claim 1, line 12, "crude stage" should be changed to --crude positioning stage--;

Art Unit: 2886

claim 1, line 12, "fine stage" should be changed to --fine positioning stage--;

claim 1, line 12, "their" should be changed to --the crude positioning stage's and the fine positioning stage's--;

claim 1, line 15, "fine stage" should be changed to --fine positioning stage--;

claim 1, line 16, "mean" should be changed to --means--;

claim 1, line 17, "the frame" should be changed to --the rigidly fixed frame--;

claim 1, line 18, "the margin of error in the positioning of the crude stage" should be changed to --positioning of the crude positioning stage margin of error--;

claim 1, line 18, "crude stage" should be changed to --crude positioning stage--;

claim 2, line 2, "positioning elements" should be changed to --the nanometer range positioning elements--;

claim 3, line 4, "rigid plate" should be changed to --rigid bearing plate--;

claim 3, line 4, "corresponding" should be deleted;

claim 6, line 5, "it allows" should be changed to --as to allow--;

claim 7, line 3, "allow" should be changed to --allows--;

claim 9, line 3, "rigid plate" should be changed to --rigid bearing plate--;

claim 9, line 4, "corresponding" should be deleted;

claim 10, line 2, "rigid plate" should be changed to --rigid bearing plate--;

claim 12, line 5, "it allows" should be changed to --as to allow--;

claim 13, line 2, "allow" should be changed to --allows--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. Claim 1, line 13 for example, recites the limitation "plane". There is insufficient antecedent basis for this limitation in the claim.

As stated above, the crude positioning stage and the fine positioning stage ([2] and [3]) are indicated with the same mark in the disclosure's figure 1. Since the crude and fine positioning stages are not differentiated in the disclosure, the claims are rendered indefinite under 35 U.S.C. 112, second paragraph.

10. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

Claim 1, lines 16-17 recites "pairs of nanometer range positioning elements on each on of the four sides of the frame. The frame, as per the disclosure, appears to possess more than four sides thus rendering the claim language indefinite under 35 U.S.C. 112, second paragraph because it is unclear to which four sides the applicant is referring.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

12. Claims 1, 3, 4, 6, 7, 9, 10 and 13 are rejected under 35 U.S.C. 102(a) as being anticipated by Hazelton et al. (US Patent No. 6,437,463).

With regard to claim 1, Hazelton et al. discloses a nanometric positioning device containing a foundation element with attached crude positioning stage capable of backward and forward travel with regard to it, wherein:

on top of the crude stage (which is equivalent to a movable portion, see Fig. 3, [114]) is attached a fine positioning stage (which is equivalent to a fine stage, see Fig. 3 [11]) with an executing element (which is equivalent to a wafer chuck, see Fig. 3, [2]) and capable of backward and forward travel with regard to the crude stage (see Col. 8, lines 8-9 and Col. 10, lines 29-35); the crude positioning stage is kinematically coupled to the foundation element (which is equivalent to a lower stage, see Fig. 2 [111]) as well as coupled to the fine positioning stage, allowing both crude and fine stages to move independently with respect to the foundation element (see Col. 8, lines 1-14);

the kinematic coupling of the crude and fine positioning stages allows for autonomous movement of the executing element with regard to both crude stage and, correspondingly, to the foundation element;

the mounting of the crude and fine stages is such that it allows their respective movement along

Art Unit: 2886

both coordinate axes of the plane (see Col. 8, lines 17-18);

the crude stage is executed in the form of a rigid bearing plate (which is equivalent to the lower ceramic plate of Fig. 3, [114]) carrying a rigidly fixed frame inside which the fine stage's executing element is situated (see Col. 8, lines 8-9);

the latter can move and be fixated fixed in a given position by mean of pairs of nanometer range positioning elements (see Fig. 3, [6] and [8]) on each one of the four sides of the frame (see Col. 4, lines 39-41); and

the margin of error in the positioning of the crude stage is smaller than the range of fine stage positioning along either of the two coordinate axes (see Col. 8, lines 1-7).

With regard to claim 3, Hazelton et al. discloses a nanometric positioning device wherein kinematic coupling of the crude positioning stage with the foundation element is realized in the form of at least two precision linear motors (which is equivalent to the two or more linear motors of the two dimensional magnet array comprising the planar motor, see Figs. 6 and 8), providing for displacing the rigid plate of the crude positioning stage along both corresponding coordinate axes (see Col. 5, lines 30-35).

With regard to claim 4, Hazelton et al. discloses a nanometric positioning device, wherein the device is equipped with the means of moving the rigid plate of the crude positioning stage along both corresponding coordinate axes on an air cushion (which is equivalent to air bellows, see Col. 4, lines 65-66 and Col. 12, lines 7-12).

With regard to claim 6, Hazelton et al. discloses a nanometric positioning device wherein the device is equipped with a system of measurement and control of the positioned object, which includes at least three measurement and control devices (see Fig. 10, [88]) with accuracy no

Art Unit: 2886

worse than the accuracy of positioning assured by the positioning elements; one of the said measuring and control devices is situated so it allows for linear control and measurement of the object's (which is equivalent to a fine stage) position along one of the coordinate axes, while the others in a way that allows for linear-polar control and measurement of the object's position with regard to the other one of the orthogonal coordinate axes in the foundation element's plane (see Col. 15, lines 15-40).

With regard to claim 7, Hazelton et al. discloses a nanometric positioning device, wherein the device is equipped with a system of controlling positioning elements, which allow for the displacement of the positioned object over a specified distance by executing element of the fine positioning stage, which is coupled to the system of measurement and control of the positioned object location (see Col. 11, lines 12-15, Col 14, 53-63 and Col. 15, lines 22-25).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 2, 9, 10, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hazelton et al. in view of Razzaghi (US Patent No. 5,701,043).

With regard to claim 2, Hazelton et al. discloses a Nanometric positioning device wherein positioning elements are realized in the form of transducers (which are equivalent to actuators, see Col. 8, lines 26-44).

Hazelton fails to disclose magnetostrictive transducers.

Art Unit: 2886

Razzaghi teaches high resolution magnetostatic transducers (which are equivalent to magnetostrictive actuators, see Razzaghi, Fig. 1 and Col. 2 lines 9-23).

Therefore, to modify the device of Hazelton et al. by employing magnetostrictive transducers in lieu of electromagnetic transducers would have been deemed obvious to a person skilled in the art for providing a simple, cost effective, creep free and high resolution linear actuator for striction-free displacement in the subnanometer to micrometer range (see Razzaghi, Col. 1, lines 42-67 and Col. 2, lines 1-7).

With regard to claim 9, Hazelton et al. discloses a nanometric positioning device wherein kinematic coupling of the crude positioning stage with the foundation element is realized in the form of at least two precision linear motors (which is equivalent to the two or more linear motors of the two dimensional magnet array comprising the planar motor, see Figs. 6 and 8), providing for displacing the rigid plate of the crude positioning stage along both corresponding coordinate axes (see Col. 5, lines 30-35).

With regard to claim 10, Hazelton et al. discloses a nanometric positioning device, wherein the device is equipped with the means of moving the rigid plate of the crude positioning stage along both corresponding coordinate axes on an air cushion (which is equivalent to air bellows, see Col. 4, lines 65-66 and Col. 12, lines 7-12).

With regard to claim 12, Hazelton et al. discloses a nanometric positioning device wherein the device is equipped with a system of measurement and control of the positioned object, which includes at least three measurement and control devices (see Fig. 10, [88]) with accuracy no worse than the accuracy of positioning assured by the positioning elements; one of the said measuring and control devices is situated so it allows for linear control and measurement

Art Unit: 2886

of the object's (which is equivalent to a fine stage) position along one of the coordinate axes, while the others in a way that allows for linear-polar control and measurement of the object's position with regard to the other one of the orthogonal coordinate axes in the foundation element's plane (see Col. 15, lines 15-40).

With regard to claim 13, Hazelton et al. discloses a nanometric positioning device, wherein the device is equipped with a system of controlling positioning elements, which allow for the displacement of the positioned object over a specified distance by executing element of the fine positioning stage, which is coupled to the system of measurement and control of the positioned object location (see Col. 11, lines 12-15, Col 14, 53-63 and Col. 15, lines 22-25).

15. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hazelton et al. in view of Novak et al. (US Patent No. 5,623,853).

With regard to claim 5, Hazelton et al. discloses a nanometric positioning device wherein the foundation element is equipped with means of fixating the crude positioning stage (see Col. 7, lines 50-53).

Hazelton does not disclose a means of fixating the crude positioning stage using the principle of vacuum suction.

Novak et al. teaches bearings using the principle of vacuum suction for preloading the air bearings of a nanometric positioning device (see Fig. 1a, [64] and [66]).

Therefore, to modify the device of Hazelton et al. by employing the principle of vacuum suction for preloading air bearings would have been deemed obvious to a person skilled in the art in order to fixate the crude positioning stage. The system is capable of fixating the crude positioning stage using the principle of vacuum suction (see Novak et al., Col. 7, lines 33-39).

Art Unit: 2886

16. Claim 8 is rejected 35 U.S.C. 103(a) as being unpatentable over Hazelton et al. in view of Suh et al. (US Patent No. 5,579,109).

With regard to claim 8, Hazelton et al. discloses a nanometric positioning device wherein the means of measurement and control of the measurement and control system for the location of positioned object sensors of the deviation of the crude and fine positioning stages' position relative to the foundation element plane (see Col. 15, lines 15-40).

Hazelton et al. does not disclose laser heterodyne interferometers.

Suh et al. discloses a heterodyne interferometer capable of measuring length and distance (see Fig. 1 and Col. 3, lines 5-47).

Therefore, to modify the device of Hazelton et al. by employing heterodyne interferometry techniques to improve the accuracy of positional determination of an object would have been deemed obvious to a person skilled in the art (see Suh, et al. Col. 1, lines 52-59).

17. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hazelton et al. and Razzaghi as applied to claims 1, 2, 9 and 10 above, and further in view of Novak et al.

With regard to claim 11, the combination of Hazelton et al. and Razzaghi discloses a nanometric positioning device wherein the foundation element is equipped with means of fixating the crude positioning stage (see Hazelton et al., Col. 7, lines 50-53).

The combination of Hazelton et al. and Razzaghi does not disclose a means of fixating the crude positioning stage using the principle of vacuum suction.

Novak et al. teaches bearings using the principle of vacuum suction for preloading the air bearings of a nanometric positioning device (see Novak et al., Fig. 1a, [64] and [66]).

Art Unit: 2886

Therefore, to modify the combination of Hazelton et al. and Razzaghi by employing the principle of vacuum suction for preloading air bearings would have been deemed obvious to a person skilled in the art. The system is capable of fixating the crude positioning stage using the principle of vacuum suction (see Novak, Col. 7, lines 33-39).

18. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hazelton et al., Razzaghi and Novak et al. as applied to claims 1, 2 and 9-13 above, and further in view of Suh et al.

With regard to claim 14, the combination of Hazelton et al., Razzaghi and Novak et al. discloses a nanometric positioning device wherein the means of measurement and control of the measurement and control system for the location of positioned object sensors of the deviation of the crude and fine positioning stages' position relative to the foundation element plane (see Hazelton et al. Col. 15, lines 15-40).

The combination of Hazelton et al., Razzaghi and Novak et al. does not disclose laser heterodyne interferometers.

Suh et al. discloses a heterodyne interferometer capable of measuring length (see Suh et al., Fig. 1 and Col. 3, lines 5-47)

Therefore, to modify the combination of Hazelton et al., Razzaghi and Novak et al. by employing heterodyne interferometry techniques to improve the accuracy of positional determination of an object would have been deemed obvious to a person skilled in the art (see Suh, et al. Col. 1, lines 52-59).

Citation of Relevant Prior Art

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Prior art Moriyama (US Patent No. 4,575,942) discloses a two dimensional moving apparatus with coarse and fine positioning stages utilizing either PZT or magnetostrictive actuators in conjunction with interferometers to precisely position an object.

Prior art Lee (US Patent No 6,281,654) discloses an XY stage with linear motors and interferometers.

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN M. NEWPORT whose telephone number is (571)270-7553. The examiner can normally be reached on Monday through Thursday, 7:30am-5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thuy V. Tran can be reached on (571)272-1828. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from

Application/Control Number: 10/520,966

Page 14

Art Unit: 2886

a USPTO Customer Service Representative or access to the automated information system, call
800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. N./

Examiner, Art Unit 4176

12/15/2008

/Douglas W Owens/

Supervisory Patent Examiner, Art Unit 2821

December 20, 2008